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Tillage type and its effect on initial seedbed soil water content and crop yields

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Surface soils in the High Barind Tract (HBT) of Bangladesh have silty clay texture (26% silt, 24% clay) and high bulk densities (1.4 to 1.6 g/cm³). Germination, emergence and early seedling growth of the winter season crops grown on residual soil moisture can be limited in these soils due to rapid drying and hardsetting of the surface soil. The traditional method of sowing post-rainy season crops in this region is broadcasting seed followed by full tillage. Minimum tillage options are now being evaluated and a study was conducted on the following tillage types: strip tillage (rotary blades only directly in front of seed delivering tynes); zero tillage: single pass shallow tillage (full rotary tillage preceding seed delivering tynes); broadcast (power tiller cultivation with broadcast seeding followed by another pass with the power tiller); and a fallow treatment was also included. The chickpea crop was sown at a soil water content considered to be optimum for germination and emergence (26 % v/v). All tillage systems had a decrease in soil water content in the seed furrow (0-6 cm) in the 23 days after sowing. The least overall loss of water was in the broadcast system at 3.3 %. Zero tillage lost the most water in the seed furrow over the period from sowing to emergence, a similar amount of soil water as land kept fallow (8.4 and 8.9 % respectively, 0 to 6 cm depth). Final emergence of chickpea seedlings in the broadcast system was significantly lower than all other systems. This may be due to the variable depth of the seed which may leave some seeds close to the surface, uncovered and exposed to air. In comparison, in the poorly covered zero tillage system the seeds were sown deeper into the furrow, without detriment to final plant establishment. Minimum tillage technology allowed timely planting of chickpea into soils with non-limiting soil water and soil strength to promote seedling emergence and growth. Continued testing of minimum tillage techniques in the HBT is required to match the surface soils conditions at sowing to the tillage type which will provide optimum plant establishment.